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SOCIETY PROCEEDINGS

THE HELMINTHOLOGICAL SOCIETY OF WASHINGTON

The fifty-first meeting of the society was held on March 17, 1921. Dr. R. T. Leiper of the London School of Tropical Medicine gave an informal talk, noting especially that he had reexamined Cobbold's type specimens of *Distomum coronarium* and found this fluke to have a structure which, so far as known at present, is unique among trematodes. This structure consists in intestinal ceca opening to the exterior of the body. In all other known flukes the ceca end blindly or open into the excretory vesicle. An examination of 12 specimens of this species, collected at the London Zoological Gardens, confirms the observation made on Cobbold's material.

In a discussion of tropisms, Dr. Leiper noted that the egg-laying habit of the Guinea worm was not in the nature of a hydrotropic response. In Loeb's work thermotropism was found to be unimportant. However, Leiper finds thermotropism apparently involved in the invasion of the skin by hookworm larvae. In tests of thigmotropism, it was found that hookworm larvae came through filter paper only in the last few drops of water. When the larvae were under a cover glass at the bottom of a preparation and the cover glass was heated, the larvae came up to the warm areas. Similarly, when a heated coin was put on one end of a slide on which there were larvae in a drop of water, the larvae quickly went toward the coin, even leaving the fluid and becoming stranded on the dry slide. Free-living nematode larvae do not react in this manner.

In connection with control measures for schistosomiasis, Dr. Leiper noted the importance of measures against snails. Mollusc eggs are quickly killed by drying. Chandler has recommended the use of copper sulphate solution against snails, a 1:1,000,000 solution killing them in 24 hours. This measure is applicable in controlling intermediate hosts of *Schistosoma*. The passage of an electric current between two pieces of copper foil in water will produce poison enough to kill snails. *Planorbis boissyi* and *Bullinus contortus* can be killed by 1:5,000,000 solutions of copper sulphate, but *Limnaea truncatula* requires a strength of 1:2,000,000. Tartar emetic will also kill snails, as Christopherson has shown. Leiper, however, is unable to confirm the statement that tartar emetic will kill the miracidia of blood-flukes, even when used in saturated solution. Apparently its action in therapeutic use is indirect, not direct.

Dr. Leiper also discussed the passage of schistosome eggs through tissues. It appears that there is an actual migration, rather than the mere passage of inert foreign bodies. After treatment with tartar emetic, these eggs come away very slowly, the contained embryos are dead, and the eggs do not cause symptoms, as live eggs do. The live eggs are not impacted in the tissues, they cause ragged edges along their paths, they pass blunt end first and the miracidia may be pointed back along their paths. It appears probable that their passage is due to a secretion. The miracidium is provided with two large glands in the anterior end of the body, and it appears that these may secrete a substance which erodes tissue as that of the glands in the cercaria does when the cercaria enters its host. It is believed that these glands function in the penetration of the tissues of the secondary host by the miracidium; it seems probable that they function in penetrating the tissues of the primary host as the egg escapes. However, in view of what is known in regard to some other flukes, Leiper doubts whether the glands function in the entrance into the body of the secondary host.

In comment on Dr. Leiper's remarks, Dr. Cort noted that he had submitted some slides showing the passage of schistosome eggs through tissue to Dr. Simon, who reported that the effect produced by the eggs could not be attributed to

the mere action of a foreign body, producing, as they do, severe reactions and eosinophilia. The movements of the eggs did not accord with those of inert foreign bodies and he was confident there was a toxin present. In answer to a question, Dr. Leiper stated that the eggs did not take a direct path toward the lumen of the involved organ, and that apparently the spine, which points backward along the path, serves to prevent the eggs going back and not to force or cut a passage.

Dr. Cort noted that when a concentrated light was turned on a culture of hookworm larvae in a Syracuse watchglass, the larvae quickly went toward the illuminated area. This had been regarded as a phototropism, but apparently, in the light of Dr. Leiper's remarks, it should be interpreted as a thermotropism. In comment, Dr. Leiper stated that the larvae never rise to the surface of a fluid under the influence of light alone.

Dr. Ransom noted that the larvae of *Haemonchus contortus* ascend the sides of a glass container and descend from time to time as conditions change; Veglia has thought that this is a heliotropism, but it may be a thermotropism. Dr. Cobb called attention to the fact that free-living nematode larvae commonly float on water and that one form parasitic in insects also floats. Some of these larvae behave as an oiled needle would and are very difficult to sink.

Dr. Bartsch stated that collectors of molluscs always carry copper sulphate, and that he has personally used it in many places in collecting. If a pint of a saturated copper sulphate solution is poured in a tide pool the size of an ordinary room, everything that can leave does so, including all sorts of worms, octopi, etc. Fish come to the surface. In fresh water, the solution does not act as effectively. Incidentally, he noted that an excellent method for collecting snails was to rub some suet on the under surface of a plank and leave it for a day or so, at which time it will be found to have attracted large numbers of snails. The suet may also be dragged over freshwater algae and water plants and in a day or so numerous snails will collect along its path.

In reply to a question, Dr. Leiper stated that a 1:1,000,000 solution of copper sulphate will kill algae and that a 1:1,000,000 solution will kill some small fish, such as "millions," the mosquito-control fish. Kobayashi says the solution interferes with rice culture, but Dr. Leiper stated that Kobayashi used too strong a solution. He stated that the solution was believed to interfere with the action of ferments and was a heart depressant. In this connection, Dr. Bartsch noted that from his observations on copper sulphate solution action on fish it would appear that the chemical interfered with respiration.

Dr. Bartsch reported that a case had come to his attention of an infestation with *Taenia saginata* in a 6-months-old child that had been fed on milk alone. In comment, Dr. Ransom suggested that there were several ways in which this might be accounted for, such as the use of a knife with which infested meat was cut, whereby a cyst might in some way be transferred directly or indirectly to the milk.

Dr. Ransom reported a *Syngamus* from the respiratory tract of a calf in Porto Rico resembling, if not identical with, *Syngamus laryngeus* heretofore known only in the Orient. Dr. Bagué, who sent in the specimen, reported that the calf had a verminous bronchitis.

Dr. Cort presented an abstract of a paper by Yokogawa on the life history of *Heligmosomum muris*. A bagging of the cuticle over the posterior end in the adult female represents the unshed cuticula of the previous molt. The free-living larva molts only once and is then infective. The larva penetrates the skin, goes to the lungs inside of 24 hours, molts in the lungs, and then goes to the digestive tract. After a third molt in the digestive tract, the worm has practically attained maturity. No fourth molt occurs, the worm retaining the last cuticula, which is attached anteriorly but loose posteriorly, especially in the female.

Dr. Cort also presented a note on the development of apparatus for recovering hookworm larvae from soil on a large scale. An apparatus used by a Dutch investigator in work in Batavia, Java, has been modified for the purposes of the expedition to Trinidad. A large brass funnel, 7 inches in diameter,

has a heavy rubber tube attached to the narrow end and a pinch cock applied to this tube. After the funnel is filled with water, a sieve is fitted in at the surface of the water. A cheesecloth layer is inserted to prevent the passage of dirt, and the dirt placed in the sieve. An hour later the pinch cock is opened and the larvae drawn off. The Dutch worker in Java says he could recover 1 of 2 larvae placed in his apparatus. With the modified apparatus, Mr. Ackert has recovered over 400 larvae of 620 placed in a pint of dirt. In the work in Trinidad, 18 funnels capable of handling 1 quart of dirt each will be used. Mr. Ackert noted that of 6 larvae placed in soil, 2 were recovered from 5 cc of fluid drawn off in 16 minutes.

In comment, Dr. Bartsch stated that he believed monel metal would be better than brass for funnels of this sort, and Dr. Cobb also advocated avoiding brass. Dr. Cobb also noted that the jig table appliances used in washing ore might be used to advantage in handling large amounts of soil to be examined for nematodes.

Dr. Ransom stated that some nematodes may have more than the classical 4 molts. In *Strongyloides ovocinctus*, a cuticula surrounding a string of eggs may be shed. *Habronema* may have more than 4 molts, though this matter needs further study. Some nematodes might have less than 4 molts.

Mr. Ackert presented a note on nematodes in a cricket.

Dr. Barlow exhibited a specimen of a female *Thelazia callipaeda*, a parasite of the eye, which had been collected alive from the feces of a Chinaman after administration of an anthelmintic.

Dr. Cobb exhibited a piece of apparatus for use as a turntable. This consisted of 2 tin pie-plates separated by 3 steel balls on which the upper plate rolled over the lower.

Dr. Cobb also presented a note on the importance of nemas. He noted that *Heterodera radicola* is unequaled as an agricultural pest. As study material he especially recommended a new species of *Rhabditis* which is easily reared on dead flies. This nema breeds rapidly and Dr. Cobb exhibited over a thousand which had developed from an original pair in the course of 10 days. The worms can be allowed to dry and will rapidly recover activity on being wet again.

Dr. Cobb also demonstrated an apparatus for exhibiting small specimens, the apparatus consisting of a tin container with a Syracuse watchglass containing the specimens at the bottom of the container, a lens attached for viewing the specimens and an ordinary electric flash light set into the top of the container for illuminating the objects to be observed through the lens. Dr. Cobb also noted that when live nemas were put in methyl violet and neutral red, the esophagus stained violet and the intestines red.

The fifty-second meeting was in the form of a dinner on April 9, 1921. The guest of honor was Dr. L. O. Howard.

The fifty-third meeting of the society was held on May 14, 1921.

Dr. Cooper Curtice was elected president, Dr. Hall recording secretary and Miss Cram corresponding secretary-treasurer.

A rising vote of congratulation was extended to Dr. Stiles for the recognition of his work in medical zoology by the recent presentation of the public welfare medal by the National Academy of Sciences.

The death of Dr. James Law, one of the early workers in parasitology in this country, was reported.

Dr. Ransom presented a paper soon to be published (*Amer. J. Trop. Med.*), by Ransom and Cram, on the course of migration of *Ascaris* larvae.

In comment, Dr. Stiles noted that medical texts commonly refer to ascariasis as a matter usually of little importance. Such work as that reported by Dr. Ransom shows that this disease is very important. As a rule ascarids in man are less frequent and less important in the city than in the country. In rural districts they may give rise to severe cases resembling hookworm disease, and it may be necessary to differentiate them by resort to microscopic examination of the feces. Both conditions call for the same attention to the proper disposal of excreta. The pathogenic rôle of *Gongylonema neoplasticum* in the production of cancer raises the question as to the possible etiological rôle of

tissue-invading worms in man in the production of pathological conditions that may develop slowly and come to light at a later period when the connection between the cause and effect is not evident.

Dr. Ransom noted that the findings indicate the danger to which children may be exposed in playing about hog lots; even though the identity of the swine and human ascarid has not yet been experimentally demonstrated and though it be assumed as possible that the adult swine ascarids would not develop in children, it is, on the other hand, quite certain that the larval stages would develop in the lungs and other organs. Dr. Bartsch suggested the possibility of using intravital staining on larvae which were injected into animals for experimental study.

Dr. Cobb presented a note in regard to the federal activities in preventing the introduction into this country of plant pests. In general, horticulturists acquiesce in the federal regulations. The dangers are so numerous that probably the best way to import plants is to import the seeds, which can be sterilized. From material about the roots of *Kentia*, an ornamental plant from New South Wales, 26 species of nematodes were collected, of which 4 species of *Aphelenchus* are new. *Tylenchus penetrans*, previously reported from several plant hosts, was reported from clover and alfalfa in Utah. A specimen of cucumber beetle from Ohio was exhibited, to show infestation with a nema, probably a species of *Aphelenchus*. Of the beetles examined, 30 per cent. were infested. These and similar parasites may have some relation to the decrease of insects following months or years in which they are extremely abundant. Dr. Cobb also exhibited a key to the species of *Aphelenchus* and one to the species of *Tylenchus*, many of the species involved being new.

In comment on the federal control work, Dr. Stiles called attention to the fact that commerce is largely responsible for the spread of pests, parasites and disease, as well as a primary cause of war. Dr. Cobb noted the importance of railroad trains as spreaders of flies, and Dr. Ransom reported some observations in Chicago in the spring of the year when he had found flies present in the railroad trains from the South and apparently not generally present elsewhere in the city. Dr. Stiles called attention to the importance of trains as disseminators of lice.

Mr. Chapin reported the collection from horse manure, in a case where the manure was being examined daily for parasites after the administration of an anthelmintic, of a bot, *Gastrophilus intestinalis*, in the pupal stage. The adult fly, a female, emerged from the pupa in 5 days, a time much shorter than the usual period of 3 to 5 weeks reported for the pupation period of this insect. As this horse was in a stall with a concrete floor from which all manure was carefully collected daily, the possibility that this bot had been passed at a much earlier date in the usual larval stage and had pupated on the concrete floor unobserved seems less likely than that the bot had remained for a long period in the cecum and had pupated there. It has been reported a number of times that bots removed from the stomach by the use of carbon bisulphide, have been found dead after a considerable time (up to 17 days) in the cecum and colon instead of being promptly expelled in the feces.

Dr. Hall reported a second case of the swine kidney worm, *Stephanurus dentatus*, from the liver of cattle. The specimen, a well developed female, was collected by Dr. J. S. Jenison at the National Stock Yards, Illinois, from a 6-year-old cow. This animal was in good condition and the kidneys were normal. The previous case from cattle was reported by Hall at the forty-ninth meeting of the society, the specimens in this case being 2 males collected by Dr. Pote at St. Louis, Missouri.

Dr. Stiles reported the receipt of a collection of hookworms from the dog in the Southern United States in which part of the specimens are *Ancylostoma caninum* and others apparently *Necator americanus*. In reply to a letter of inquiry by Dr. Stiles, the physician who collected the worms writes that there is no possibility of confusion or error in regard to the specimens or the host. Dr. Stiles reported that on a former occasion he had found 1 female hookworm that might be *Necator* in the dog.

Dr. Stiles reported that he had been compiling the literature on chemical means for the destruction of nematode eggs in feces, and now had an extensive bibliography on this subject. Oftentimes it is difficult to determine from the name of the chemical used just what substance is meant. Much of the work is of only academic interest, since the chemical tested is too expensive for general use. It appears that in some soils and some mines the destruction of eggs in feces is accomplished by the natural chemical content.

Dr. Stiles reported that the subject of ground water pollution is to be again investigated experimentally in a selected area by the use of typhoid bacilli, as the previous findings with *Bacillus coli* were distinctly in conflict with generally accepted views and might be objected to on the grounds that *B. coli* is a widely distributed form that occurs rather generally and might be found in tests where it was present from sources other than the material used in testing.

Dr. Stiles also reported tests of gas house tar on the city dump at Mobile, Alabama, for the control of flies. The tar destroyed many flies and drove the others to nearby houses, but its action was transient and after a short time it dried and the flies returned. It would require large quantities to be of service under these conditions and apparently the general use of the tar will only be of service in the case of privies and on similar small areas and quantities to be treated, and not for use on large areas or large quantities. Samples of tar vary widely in composition. The tar is distinctly less effective against flies of the genus *Eristalis* than against those of the genus *Musca*.

In comment on Dr. Stiles' notes, Dr. Ransom noted that *Ancylostoma duodenale* or a morphologically similar form had been reported from swine in the Orient by O'Connor and that *A. braziliense* and *A. ceylanicum*, which species Leiper regards as identical, are reported from the dog and *A. ceylanicum* from man also. He also reported the occurrence of *Uncinaria stenocephala* from the pig in Canada, noting that the common hookworms of dogs in this country is *A. caninum*, but that the hookworm of foxes is *U. stenocephala*. He further reported that he finds *U. polaris* Looss to be a synonym of *U. stenocephala* on the basis of an examination of material of both species. The difference in distribution of *A. caninum* and *U. stenocephala* may be correlated with latitude, *U. stenocephala* apparently ranging north of *A. caninum*.

Dr. Bartsch exhibited a specimen of monel metal in connection with the question of screens and other apparatus for helminthological work and screening against flies. This material, a natural alloy, costs about as much as brass and lasts much longer.

MAURICE C. HALL, *Recording Secretary*.